EXP-43

July 10, 1973

ACCELERATOR EXPERIMENT--Main Ring Injection Studies

Experimentalists: R. L. Cassel and R. F. Stiening

Date Performed: 9 July 1973

It has been known for some time that the manner in which the Main Ring magnets are de-excited affects the accelerated beam intensity. The purpose of this experiment was to investigate this effect.

During this experiment, the accelerator was operated with a flat-top energy of 300 GeV. A variety of de-excitation cycles were tried, including a very long cycle which doubled the time required to go from 300 to 8 GeV. (The normal time for 300 to 8 GeV is 0.8 seconds; the long time was 1.7 seconds.) The only significant effect was observed when we used a cycle which first de-excited the magnets to nearly zero current and then approached the 8 GeV injection level from below. We shall refer to this case as an "undershoot" recovery. The case where the magnet current smoothly approaches the 8 GeV level from above will be called a "coast-down" recovery. In the table below, we summarize the less significant differences between these cases.

	UNDERSHOOT	COAST-DOWN
Bending Magnet Current	97.50 Amps	96.25 Amps
$(\partial\nu_x/\partial p)p$	0	-15
$(\partial\nu_y/\partial p)p$	-66	-15
Closed Orbit	3 cm peak-to-peak horizontal closed orbit distortion without correction	Nominal centered orbit

Table 1. 8 GeV Main Ring Parameters

The measurement of $\frac{\partial \nu}{\partial p}$ was made with a centered orbit in both cases, but with no change in the iron correction sextupoles. All of the above data indicate that the average remanent field in Main Ring magnets is reduced about 25% when an undershoot recovery program is used.

After the above measurements were completed, the iron sextupoles were adjusted to give low $p\frac{\partial \nu}{\partial p}$ with the undershoot program. The .3-second transmission of the 8 GeV beam for $\nu_x = \nu_y$ was measured as a function of quadrupole current.

In Figure 1A, we show the results of this experiment. (The horizontal scale is given in units of computed $\delta\nu$.) A comparison with data taken during coast-down operation is shown (Figure 1B). It is clear that although the undershoot reduced the average remanent field, it greatly increased the differences among magnets which drive betatron resonances.

Summary

It is found that for stable machine operation, the Main Ring magnet current should approach the 8 GeV injection level from above rather than from below.

R. F. Stiening

RFS:cb

UNDERSHOOT DE-EXCITATION

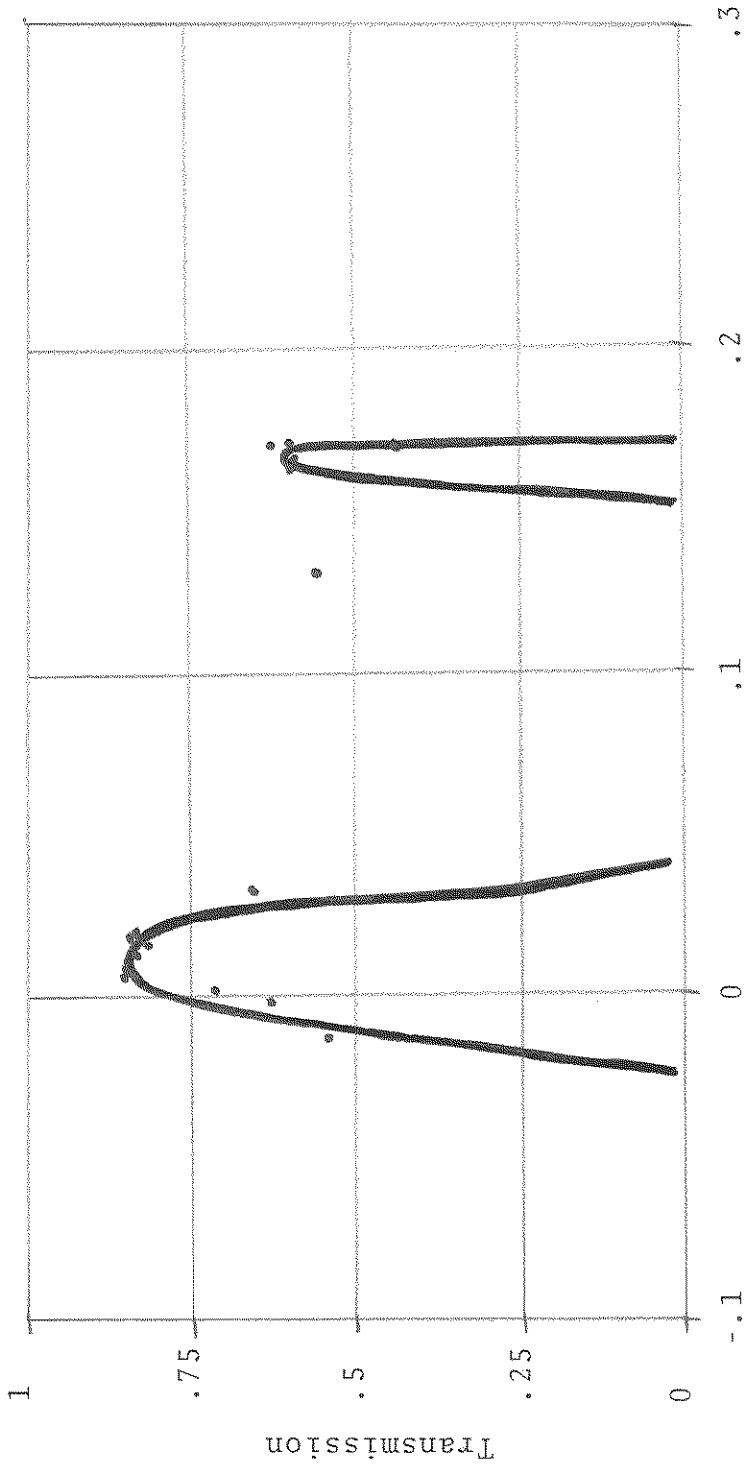

Figure 1A. Tune Change

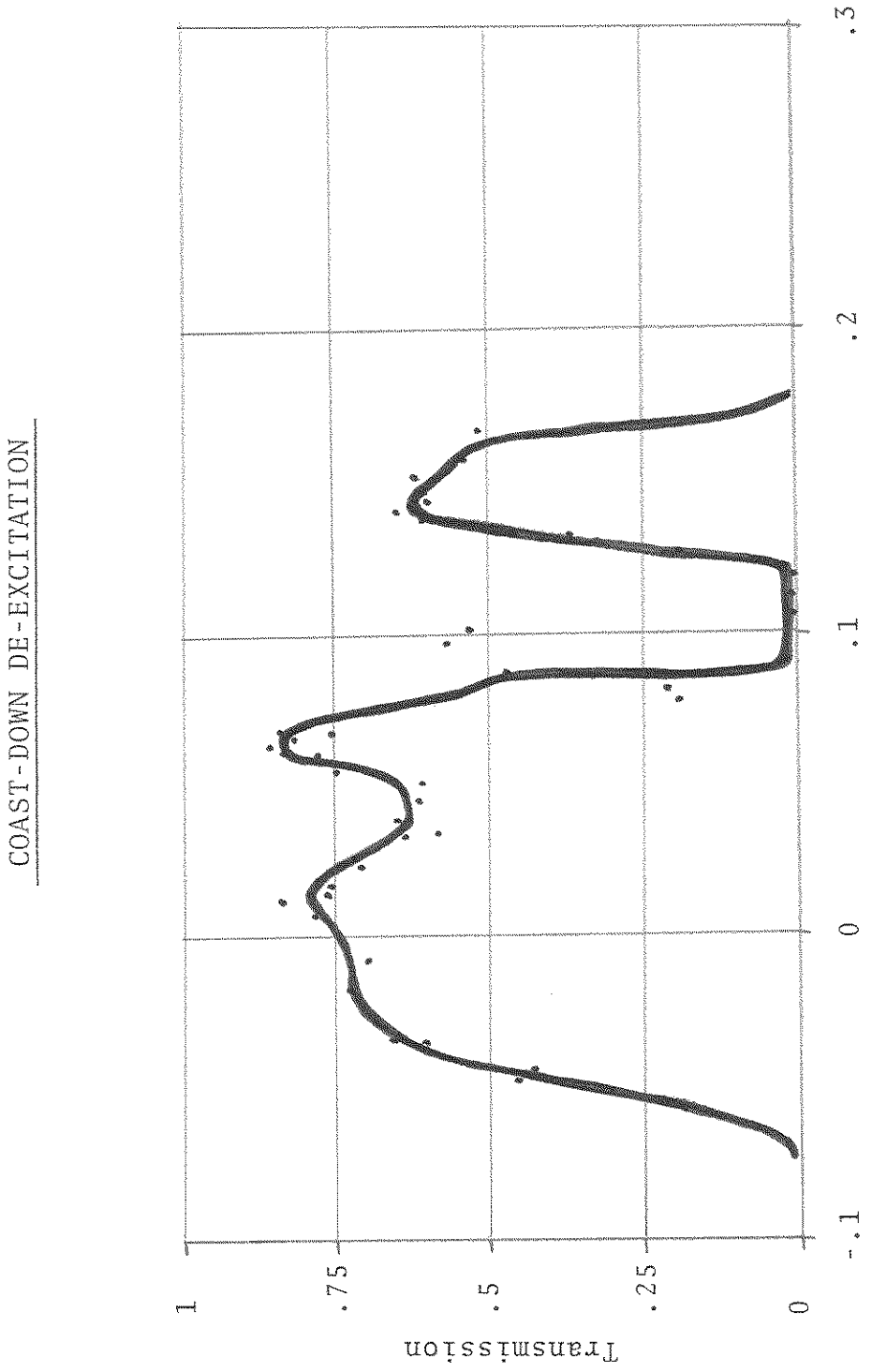

Figure 1B. Tune Change